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System-wide Advancement of User Centric Climate Forecast Products

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Abstract
This primary objective of this project is to improve access to and understanding of climate forecast products issued by the Climate Prediction Center (CPC). The project has three main areas of activity:

(1) Implement CPC support of web services. A web services capability allows dynamic interaction between users and CPC products, and communication of product attributes through the CLIDDSS information portfolio manager and report generator.
(2) Support user-centric forecast evaluation. Users should be able to evaluate the skill of forecast products in terms that are meaningful to their specific application.
(3) Improve forecast product formats. This involves field testing of product formats to confirm reliably correct interpretation across application sectors.

Project Activities and Results
During this reporting period, we transitioned away from the transfer of the Forecast Evaluation Tool (FET) to the CPC; we continue to provide feedback to CPC related to their efforts to develop tools for public verification of forecast skill. We focused instead on improving CLIDDSS capacity to integrate with dynamic products being developed by CPC and under this project. We also focused on design, implementation, and field testing of dynamic forecast products, specifically the Probability of Exceedance (POE) graph.

CLIDDSS Development
During this reporting period, we have substantially upgraded CLIDDSS usability for users (i.e., individuals or groups that manage information portfolios and reports) and are near completion of upgrades for provider usability. The user upgrades include a more intuitive and powerful user-controlled directory structure for managing the multiple information products from diverse sources, and a WYSIWYG interface for generation of reports or newsletters. The provider upgrades include support for REST services as well as SOAP services, and a capability to specify several groupings of product elements (e.g., logos, contact information, legends, joint selection of multiple products into integrated groups).

User-controlled Forecast Verification
We discontinued work on transfer of the FET software code to CPC under this project due to issues that were not resolvable given project resources and the need to maintain progress on other objectives of this project. Transfer of the FET code to CPC was not an

explicit objective of this project, but an exploratory effort was initiated at the request of the CPC as a means to provide user-centric forecast verification. It was considered a high-risk activity due to the lack of CPC staff experience with Java code and advanced web applications. We submitted another CTB proposal, including the Colorado Basin River Forecast Center (CBRFC) as an additional collaborator, to provide additional support for CPC staff to learn Java code and transfer the FET using a phased test-based approach modeled after the NWS Community Hydrologic Prediction System (CHPS) project. However, that proposal was not funded.

Two issues proved intractable under this project. One, the FET was not designed to automatically update without recompiling. Code adjustments to provide automatic data updates, while possible, were considered by CPC to be too difficult for staff to implement within FET code. UA programmers could have made the code changes but the effort would have compromised achieving the other project objectives. The need to recompile periodically, while not considered problematic by the NCEP Web Operations Center (WOC), was seen as intractable by CPC staff. Instead, the CPC decided to internally design and implement a forecast verification webtool consistent with staff experience and design preferences. CPC has developed and staffed a detailed plan to develop those tools, beginning with the 8-14 day forecasts and eventually extending to all CPC forecasts.

Through the exploratory transfer of the FET, CPC has completely adopted the practice of version control and bug-tracking, making code development much more efficient and manageable than using prior approaches. CPC considers this outcome, while unanticipated, to perhaps be more significant than the original project goals.

We are also working to understand and document the different perspectives of an operational product provider (CPC) and academic applications developer (UA) in the design and implementation of web applications. Our experience should prove insightful for other groups working to develop web applications. The message is not necessarily that software should be developed jointly with the operational agency, since many tools are developed as prototypes and cannot demonstrate long-term sustainability and use, and new tools that are technologically more advanced require operational agencies to change policies and practice that may be more or less acceptable or able to be accommodated by different units within an agency.

User-Customized Forecast Products

During this reporting period, we renewed activity on developing a user-controlled dynamic Probability of Exceedance (POE) product. At the request of CPC, we have focused on the 90-day POE due to complicated behaviors in the 8-14 day POE that posed difficulties in interpretation. The 90-day POE has been publicly available for years and has been the subject of intense development by the product and verification teams within the CPC to increase the usability, portability, reliability, flexibility and staff understanding of the seasonal POE technical processing.

In the last reporting period, we developed a mock layout for the dynamic POE that, when fully implemented, will allow users to incrementally build a version of the POE that fits their specific application needs and cognitive framework. During this reporting period, we substantially revised the layout in consultation with a graphic designer. Dynamic POE components include: the graph of the last 30 years of observed temperature or (transformed) precipitation, the graph of Gaussian fit to the last 30 years of observed temperature or (transformed) precipitation, plotting of the most recent 10 or 15 years of observations, the graph of the mean and error bars of the forecast, sliding probability thresholds or intervals, and the additive construction of the above pieces into a successively more complex product.

Next Steps

In light of the time used to explore FET transfer to CPC, we will be requesting a 1-year no-cost extension of this project. We would like to complete development of a dynamic product, incorporate field testing of format effectiveness with CPC staff participation, and fully link dynamic products, including the CPC verification tool, to CLIDDSS. We would also like to write a joint paper on research-to-operations transfer of software from the perspective of research and operations perspectives. These activities are achievable with a 1-year extension.